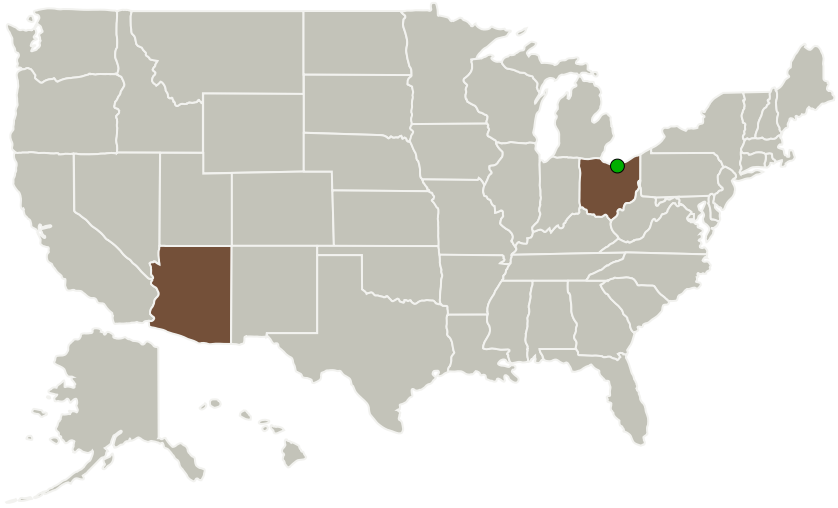
Embedded Data Acquisition Tools for Rotorcraft Diagnostic Sensors, Phase II

Completed Technology Project (2011 - 2013)

Project Introduction

Ridgetop's innovation addresses the need for improved capabilities for detecting wear in the drive gears inside helicopter gearboxes. Rotorcraft drive trains must withstand enormous pressure while operating continuously in extreme temperature and vibration environments. Captive components, such as planetary and spiral bevel gears, see enormous strain but are not accessible to fixed instrumentation such as a piezoelectric transducer. Thus, it is difficult to directly monitor components that are most susceptible to damage. Ridgetop has developed an embedded data acquisition module that overcomes these limitations. This innovation is a self-contained data processing unit within a specialized fixture that installs directly inside the hubs of rotating gear parts. From this location, it and detects and transmits high fidelity prognostic data to a fixed transceiver. The sensor is based on MEMS technology and uses innovative circuit designs to capture high bandwidth data and transmit it wirelessly from inside an operational helicopter transmission. In Phase 2, Ridgetop will build the module and acquisition system, and demonstrate it at the NASA Glenn Rotorcraft transmission testbed. We will provide evidence that the innovation gives superior fidelity by making side-by-side comparisons with current fixed-sensor setup. Ridgetop will tie in data collection with prognostics and advanced diagnostic approaches, make enhancements, and show an improvement in failure detection horizon times. We will also develop a data interface between the wireless sensor port and a standard HUMS communication bus. Finally, Ridgetop will develop a commercialization path by demonstrating the technology to airframe manufacturers.

Primary U.S. Work Locations and Key Partners



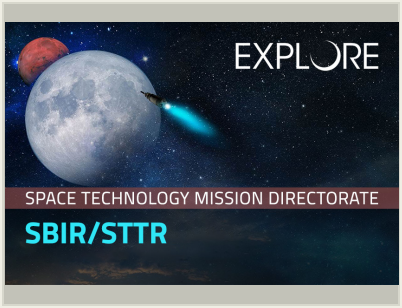


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Ridgetop Group, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Tucson, Arizona
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Arizona	Ohio

Project Transitions

June 2011: Project Start

May 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138973)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Ridgetop Group, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

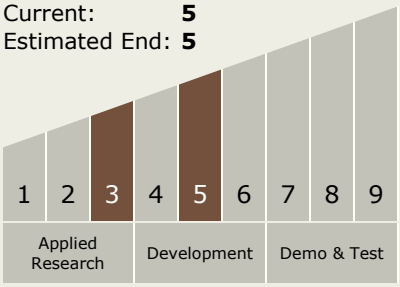
Carlos Torrez

Principal Investigator:

Matthew Engelman

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.4 Reliability, Life Assessment, and Health Monitoring

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System